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## AFRL technology inducted into Space Hall of Fame

*COLORADO SPRINGS, Colo.* — Air Force Research Laboratory representatives were on hand April 1 as multi-junction solar cells were inducted into the Space Technology Hall of Fame at the 20<sup>th</sup> National Space Symposium, sponsored by the U.S. Space Foundation.

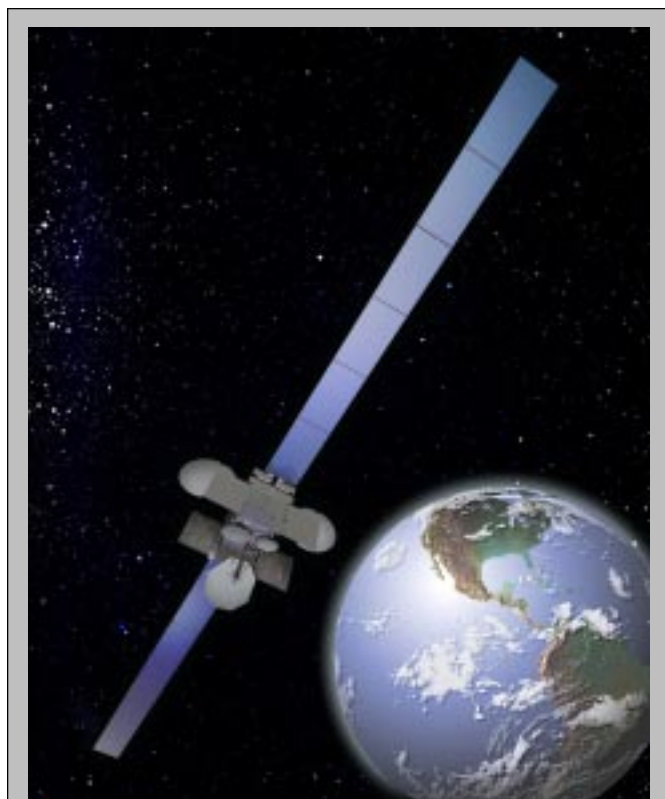
Responding to the need for increased spacecraft payload power and mass budgets, AFRL sponsored research and development efforts to produce high-efficiency, multi-junction (MJ) space solar cells. Beginning in the late 1980s, AFRL efforts have boosted space MJ cell efficiency from 16 to 28 percent for triple-junction cells today.

"The AFRL solar cell research and development team acknowledged by this induction had a wonderful time working throughout the 1990s to increase cell efficiency, which is unprecedented in the history of solar cell development," said team member Dr. Kitt Reinhardt, Space Vehicles Directorate, Kirtland Air Force Base.

Use of MJ solar cell technology provides a direct replacement for lower efficiency single-junction cells. Thus, MJ cells enable significantly greater power to the spacecraft payload for constant solar array area, or greatly reduced solar array mass for constant solar array power output, which allows greater effective payload mass.

The end result is significantly reduced space mission lifecycle costs for the spacecraft program office.

The AFRL effort demonstrates successful implementation of the agency's research and development program, manufacturing technology (ManTech) program, and dual-use science and technology commercialization program. Boeing's Spectrolab, utilizing AFRL funding as well as its own resources for development, now produces commercially available and affordable triple-junction solar cells.



Triple junction solar cells are used to power the Boeing 702 satellite, Galaxy IIIC, pictured. AFRL research has improved the efficiency of the cells.

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## ICE beneficial for AFMC cost estimating

*by Gary Cunningham, Materials and Manufacturing Directorate*

WRIGHT-PATTERSON AIR FORCE BASE, Ohio—A new computer-based, cost-estimating tool promises to save Air Force Materiel Command acquisition experts money and time by taking minutes to do what used to take weeks.

Command officials recently purchased a multi-site license for the Integrated Cost Estimating (ICE) tool. Experts from Frontier Technology, Inc., developed the ICE program six years ago under a Small Business Innovation Research project. Officials at the Air Force Research Laboratory's Materials and Manufacturing Directorate manufacturing technology division manage it.

ICE uses a top-level, work breakdown structure to specify a new system concept or technology's detail characteristics at the appropriate system level, said Al Herner, manufacturing technology division ICE program manager. This allows users to define the concept in as much detail as necessary to examine cost sensitivities of various design options and to examine the concept's application to an existing weapon system.

"System 'wizards' provide an easy-to-use, structured approach to define the technology concept and to describe its functional parameters," he said.

The cost results are then transferred into Microsoft Excel, Word or text file formats, Mr. Herner said. Graphs are generated to illustrate the technology concept's cost savings and show the estimated cost impact and return on investment. Operations and support cost values are expressed in the cost categories the Department of Defense Cost Analysis Improvement Group favors.

Mr. Herner said ICE has been used to analyze costs on large airframe systems, and analysis that previously took two weeks was accomplished in less than five minutes.

"Purchasing the ICE tool will save up to 90 percent of the time and reduce the number of people required from several to just one in many instances, providing an effective cost-analysis capability for AFMC," Mr. Herner said. "With its ability to show in minutes the cost savings of one technology choice compared to another, AFMC decision-makers can focus efforts and resources on the best value choices in their search for better performance at affordable life cycle costs."

He said AFMC acquisition specialists will use the tool throughout their systems acquisition-related organizations as a key element to increase the cost-estimating capability across the entire Air Force.

"The license enables people at AFMC centers to use the tool, as a computerized system, to reduce the time required for weapon system cost estimates from months or days to hours or less," he said.

Herner explained that concepts and technologies for military systems have historically been evaluated based primarily on performance. ICE, however, selects the best value by integrating cost models and weapons system operations and support data.

He said Air Force leaders emphasize affordable systems and technologies for either increasing performance, reducing costs or for extending the operational life of a system. This need for more affordable systems required tools to reliably assess a system's life cycle cost and affordability before the weapon system technology development manager prioritizes and assigns funding.

For more information on ICE, contact the technology information center at 255-4689. @

# College students attend IF's information exchange day

by Francis L. Crumb, Information Directorate

ROME, N.Y. — Prospective new hires from 11 colleges and universities visited the Air Force Research Laboratory's Rome Research Site Feb. 26 to participate in the AFRL Information Directorate's Information Exchange Day.

The event is designed by the directorate management, human resources personnel, scientists and engineers to provide the opportunity for prospective new hires to learn about the Information Directorate, and likewise, for the Information Directorate to learn more about each individual's interests, career goals and strengths. The visitors were welcomed by Director Raymond P. Urtz and given an overview briefing by Steven Farr of the Information Systems Division.

The individuals invited visited the four technical divisions within the Information Directorate, attended briefings and demonstrations, and participated in one-on-one information exchanges with scientists and engineers. Registration and lunch socials allowed the visitors to interact with recent directorate new hires to learn more about their initial experiences working at the Rome Research Site.

Approximately 40 individuals, with backgrounds in computer science/engineering, electrical engineering, physics and/or mathematics, participated in the event. Vacancies currently exist in these technical disciplines at the Rome Research Site. Scientists and engineers involved in the one-on-one information exchanges made recommendations for hiring individuals to fill the needs of the organization. @

## Rome engineers attend situational combat exercise

by Francis L. Crumb, Information Directorate

ROME, N.Y. — An Air Force Research Laboratory engineer and several contractors viewed the Blue Flag 04-02 exercise to observe the Air Operations Center (AOC) personnel in realistic combat situations.

Carl A. DeFranco Jr. of the AFRL's Information Directorate's Systems Concepts and Applications Branch attended the wargaming activities held at Davis-Monthan Air Force Base, Ariz. He was accompanied by several contractor personnel from

Joint Air Ground operations, Unified Adaptive Replanning (JAGUAR) program. JAGUAR is sponsored by the Defense Advanced Research Projects Agency (DARPA) of Arlington, Va.

In addition to observing the AOC personnel activities during the exercise, Mr. DeFranco and his JAGUAR contractors were able to discuss methods and information requirements with several of the AOC division chiefs. They were also able to learn the requirements for planning and managing

air operations.

Information obtained during the exercise visit will be used to plan and execute the JAGUAR program over the next four years. The Information Directorate is DARPA's technical agent for JAGUAR and in October awarded five contracts, with a combined value in excess of \$36.5 million, for research and development of the technologies envisioned to enhance the capabilities of AOCs, while reducing requirements for manpower. The JAGUAR pro-

gram will attempt to provide significant automation of the AOC processes for planning and executing air operations.

Contractors working on JAGUAR research are The Charles Stark Draper Laboratory Inc., Cambridge, Mass.; Lockheed Martin, Advanced Technology Laboratories, Cherry Hill, N.J.; BBNT Solutions LLC, Cambridge, Mass.; ALPHATECH, Inc., Burlington, Mass.; and Northrop Grumman of Fairfax, Va. @

## Air Vehicles Directorate scientists create molding techniques

by Melissa Withrow, Air Vehicles Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Scientists at the Air Vehicles Directorate are perfecting new windshield injection molding techniques that will save on cost and production time.

They are testing this new technology by creating windshields for the Air Force's T-38 Talon supersonic jet trainer. Using injection molding will cut down the time it takes to form a T-38 windshield from months to approximately 20 minutes. Unlike thermal forming, injection molding produces identical replicas. Therefore, scientists can conduct full scale testing of these windshields with confidence that the results are equally applicable to all windshields produced. In addition, the injection process limits thermoplastic degradation by requiring only one heating and cooling cycle. The thermoplastic resin is heated once prior to injection and then cools in the mold.

Injection molding is not a new process. However, using the technique to create a windshield required producing a mold in the shape of a perfect optical surface—a very difficult process. This technique has future applications for all military aircraft. So far, scientists have made molds for the T-

38 and the Joint Strike Fighter prototype. Future commercial applications include automobiles, helicopters and commercial jets. @

### Hall of Fame from page 1

Multi-junction solar cells have been used in commercial, civil and government space programs, and are the standard for high-power communication satellites, as well as for many NASA and other missions.

Spectrolab triple junction solar cells are currently powering numerous commercial and government satellites, including Galaxy IIIC, a Boeing 702 satellite that is one of the most powerful satellites ever launches into space.

AFRL representatives honored at the 16<sup>th</sup> Space Technology Hall of Fame dinner in Colorado Springs, Colo. included Dr. Reinhardt, Dr. Dean Marvin, Ralph James, Clay Mayberry, David Keener and Joe Wise.

Also honored at the dinner were four associates of Boeing's Spectrolab — Bruce T. Cavicchi, James Ermer, Dr. Nasser H. Karam and Dr. Richard R. King. @



# DARPA agent markup language becomes web standard

by Francis L. Crumb, Information Directorate

ROME, N.Y. — The DARPA Agent Markup Language (DAML) Program, to which the Air Force Research Laboratory's Information Directorate provides technical support, achieved a major milestone with the World Wide Web Consortium (W3C) approving the Web Ontology Language as an official web standard.

DAML, funded by the Defense Advanced Research Projects Agency (DARPA) of Arlington, Va., enables powerful web-based capabilities beyond those offered using Hyper Text Mark-Up Language/Extensible Markup Language (HTML/

XML) - the current information mark-up languages used to create web pages. The goal of the DAML program is to create technologies that will enable software agents to dynamically identify and understand information sources, and to provide interoperability between agents in a semantic manner.

"The W3C's Web Ontology Language, known as OWL, is largely based on the DAML specification developed by the DAML program," said Mark Gorniak, program manager in the directorate's Information Technology Division. "OWL is a new markup language that makes

possible the next-generation Semantic-web, a web of machine-processable data that parallels and improves upon the current human-readable page-based web."

W3C endorsement indicates that DAML technology is suitable for transition out of the research and development community and into a commercial community, to enhance the functionality and interoperability of the web.

One such functionality provided by OWL is a "Smart Search" capability. OWL's unique combination of knowledge representation on the web

and the ability to reason with this knowledge will improve the utility of web-based queries, allowing browsers to return results that are accurate and precise, instead of the hundreds or thousands of responses that are retrieved today using keyword search.

The Information Directorate has several ongoing research projects applying OWL/DAML in the development of ontology-based applications. Potential applications are for the Air Mobility Command, Joint Battlespace Infosphere and Effects Based Operations. @

## VA scientists create flow control tool

by Melissa Withrow, Air Vehicles Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Air Force Research Laboratory scientists from the Air Vehicles Directorate (VA) are creating a new tool under the Flow Control Analysis Development (FlowCAD) program.

The tool will facilitate designing flow control devices by modeling their behavior. Currently, scientists use a trial and error design method, but the new tool will tell them how effective a flow control device will be prior to building it. This capability will save the Air Force time and money.

VA recently completed the first stage of tool development with three days of wind tunnel testing at the Aircraft Research Association in Bedford, England. During testing, scientists collected data measuring how high- and low-frequency flow control devices affected air flow over weapons bay openings at transonic speeds. This testing was the first of three experiments designed to collect data that will further understanding of flow control.

Opening weapons bay doors during high-speed flight creates a shear boundary layer or an area where airflow transitions sharply from the high speed air flow outside the weapons bay to slower speed air flow within the bay. As a result, pockets of circular rotating air hit the weapons bay walls and generate an acoustic wave. This wave flows back up the air stream producing acoustic resonance, which causes strong vibrations that may damage the aircraft and its systems. Flow control devices are designed to counter this effect. @

## Target identification system nears completion

by J. Rich Garcia, Directed Energy Directorate

KIRTLAND AIR FORCE BASE, N.M. — For U.S. forces to pinpoint a military target, eight separate military systems weighing up to 60 pounds total are needed. Air Force researchers at Kirtland Air Force Base have been able to combine these systems into a single, 10-pound piece of combat gear that is expected to be ready for production before the end of the year.

The Laser Integrated Target Identification System, developed by the Air Force Research Laboratory's Directed Energy Directorate, uses laser-based technology to identify a target's range and "paint" a laser spot on the target that will guide munitions to it. It is capable of spotting targets by day or night. Included is a geolocation system to further identify an exact location and an efficient, lightweight battery capability.

This system will be used by combat controllers from the Air Force Special Operations Command, complementing their Battlefield Air Operations kits, which were designed prior to Operation Iraqi Freedom to improve the manner in which target coordinates are relayed.

According to Maj. Jeff Salter, who heads the directorate's Tactical Laser Systems Branch, "This is a two-year project aimed at reducing the weight and size of equipment that a combatant must carry in a battlefield. The overall cost of this development effort is around \$19 million."

The next step is to transition the technology to a product center where production can begin. All of the services will be able to use the completed system. @

# ML Directorate hosts aviation fluids and lubes workshop

by Timothy R. Anderl, Materials and Manufacturing Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Air Force warfighters commonly face situations where the readiness and operability of aircraft materials and systems can mean the difference between mission success or failure.

Scientists and engineers from the Air Force Research Laboratory's Materials and Manufacturing Directorate have invited their partners from government and industry to participate in a workshop. The workshop will focus on keeping reliable and affordable materials at the warfighters' fingertips, and to ensure that their systems and technologies are mission ready when warfighters need them most.

The fourth biennial Military Aviation Fluids and Lubes Workshop, which is hosted by the ML Nonstructural Materi-

als Division's Fluids and Lubricants Group, is scheduled to take place at Hope Hotel from June 15 - 17. The workshop will offer participants the opportunity to share concerns, insight and solutions to issues as diverse as hydraulic fluid purification, environmentally friendly solvents, aircraft maintainer issues, turbine engine lubrication, and aerospace greases.

"In today's wartime environment it is especially important that we can maintain, sustain, and ensure the operational capabilities of the aircraft systems and technologies that our warfighters need to dominate conflicts," according to C. Ed Snyder, an expert from the Fluids and Lubricants Group. "Turbine engines, hydraulic systems and landing gear are just a few examples of areas

where fluids and lubricants are critical to the operation of an aircraft. Our goal for the workshop is to bring aircraft designers and other representatives from industry, aircraft manufacturers, maintainers and pilots to the table to interface about their shared concerns and issues."

According to Mr. Snyder, the workshop will feature speakers from across the Air Force, including AFRL's Materials and Manufacturing and Propulsion Directorates, the Aeronautical System Center's Pollution Prevention Group, the Air Force Safety Office, the Aging Aircraft System Program Office, and the Air Logistics Center at Hill Air Force Base, Utah. In addition, representatives from the Navy, Army and the aircraft industry will also make presentations. ML rep-

resentatives have also designed a special interchange with Air Mobility Command maintainers to address issues they commonly face while on the flightline.

"The information that we share and discuss at the workshop will allow participants, from whatever area of service, career field or capacity, to continue to maintain and improve those complex, linch pin systems that ensure the success of our operational forces," Mr. Snyder said.

For more information or to register for the Military Aviation Fluids and Lubes Workshop, please contact Ms. Barb Hager by e-mail, [AFRLMLBOfficeAccount@wpafbafmil](mailto:AFRLMLBOfficeAccount@wpafbafmil), or by phone, (937)255-5731. @

## AFRL commander speaks at Rome Research Site



ROME, N.Y. — Maj. Gen. Paul Nielsen, Air Force Research Laboratory commander, addresses personnel at the AFRL Rome Research Site during his March 23-24 visit to Rome, NY. (Air Force Photograph by Albert P. Santacroce)

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# Net Index

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Due to the number of submissions we receive, some sections of news@afrl are available exclusively on-line. The on-line version of the newsletter allows users to view the AFRL corporate calendar, news releases generated by AFRL headquarters, operating instructions, L@b L@urels and Roundups sections.

The L@b L@urels section of the electronic newsletter is dedicated to members of Air Force Research Laboratory who receive awards and honors. The Roundups section of the electronic newsletter keeps Air Force Research Laboratory employees informed about contracts AFRL has awarded. Below is an index of articles one can find in each of these on-line sections.

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L@b  
L@urels

Roundups

- HE Directorate names annual award winners

- DOD-level awards given to ManTech engineers

- Rome awards contract for study of software packages

- Rome awards research contract to Vernon company

To view the full text of these and other articles visit the news@afrl page on the Internet at <http://extra.afrl.af.mil/news/index.htm>.

To submit L@b L@urels or Roundups from your directorate, send a query to AFRL Public Affairs at:

[Jill.Bohn@afrl.af.mil](mailto:Jill.Bohn@afrl.af.mil)

**For more on these stories see news@afrl**

**<http://www.afrl.af.mil/news>**

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## Sensors scientist named fellow of Institute of Physics

*by Grace Janiszewski, Sensors Directorate*

**HANSCOM AIR FORCE BASE, Mass.** — A scientist from Air Force Research Laboratory's Sensors Directorate has been named a fellow of the Institute of Physics, Britain's professional organization for physicists.

Dr. Richard A. Soref has been a pioneer in silicon-based photonics and optoelectronics — the science and technology of building light-emitting, light-detecting, and light-guiding devices on the silicon wafers used in computers — for more than a decade. This research is now entering mainstream device applications. He invented many types of waveguides on silicon, and also waveguide-integrated optical switches.

"I am honored to receive this recognition," said Dr. Soref. "I am flattered to join the elite group of scientists who are fellows of the Institute of Physics."

In recent years, Dr. Soref has invented laser structures based on semiconductor materials. He has managed many Air Force research contracts, including two recent DARPA-funded projects that each had a value of \$1 million.

Author of 115 refereed papers and 7 book chapters, Dr. Soref also holds 49 US Patents and is a recipient of the Air Force Basic Research Award. He is also a fellow of the Air Force Research Laboratory. @



**Dr. Richard A.  
Soref**